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IS 3726 (2003): Thumb Screws [PGD 31: Bolts, Nuts and Fasteners Accessories]

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भारतीय मानक

थम्ब स्क्रू — विशिष्टि

(दूसरा पुनरीक्षण)

Indian Standard

THUMB SCREWS — SPECIFICATION

(Second Revision)

ICS 21.060.30

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Price Group 6

Bolts, Nuts and Fasteners Accessories Sectional Committee, BP 33

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Bolts, Nuts and Fasteners Accessories Sectional Committee had been approved by the Basic and Production Engineering Division Council.

This standard was first published in 1966 covering four types of thumb screws. It was first revised in 1972 and brought in line with DIN 464-1960 'Knurled thumb screws' and DIN 465-1970 'Slotted knurled thumb screws' and another type E, flat thumb screw was included as per DIN 653-1971 'Flat thumb screws', a separate clause on tolerance was also included.

In this revision the standard has been brought in line with the latest DIN 464-1986 (clubbing DIN 464 and DIN 465) and also DIN 653-1986. Further the standard is also brought in line with the relevant IS/ISO Standards and hence the tolerance clause has been deleted.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard
THUMB SCREWS — SPECIFICATION
(Second Revision)

1 SCOPE

This standard covers the requirements of knurled thumb screws and slotted knurled thumb screws in the size range of 1.0 to 10 mm.

2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1367	Technical supply conditions for threaded steel fasteners:
(Part 1) : 2002	General requirements of bolts, screws, studs and nuts (*third revision*)
(Part 2) : 2002	Tolerances for fasteners — Bolts, screws, studs and nuts — Product grades A, B and C (*third revision*)
(Part 3) : 2002	Mechanical properties of fasteners made of carbon steel and alloy steel — Bolts, screws and studs (*fourth revision*)
(Part 9/Sec 1) : 1993	Surface discontinuities, Section 1 Bolts, screws and studs for general applications (*third revision*)
(Part 11) : 2002	Electroplated coatings (*third revision*)
(Part 14/Sec 3) : 2002	Mechanical properties of corrosion resistant stainless-steel fasteners, Section 3 Set screws and similar fasteners not under tensile stress (*third revision*)
(Part 17) : 1986	Inspection, sampling and acceptance procedure (*third revision*)
(Part 18) : 1996	Packaging (*third revision*)
(Part 20) : 1996	Torsional test and minimum torques for bolts and screws with nominal diameters 1 mm to 10 mm
1368 : 2002	Fasteners — Ends of parts with external ISO metric threads (*fourth revision*)
1369	Fasteners — Threads run-out and under-cuts:
(Part 1) : 1993	Dimensions for screw thread run-out for external ISO metric threads (*third revision*)
(Part 2) : 1993	Dimensions for screw thread under-cut for external ISO metric threads (*third revision*)
3403 : 1981	Dimensions for knurls (*revised*)
4218	ISO general purpose metric screw threads:
(Part 1) : 2001	Basic profile (*second revision*)
(Part 2) : 2001	General plan (*second revision*)
(Part 3) : 1999	Basic dimensions (*second revision*)
(Part 4) : 2001	Selected sizes for screws, bolts and nuts (*second revision*)
6649 : 1985	Hardened and tempered washers for high strength structural bolts and nuts (*first revision*)
14962	ISO General purposes metric screw threads — Tolerances:
(Part 1) : 2001	Principles and basic details
(Part 2) : 2001	Limits of sizes for general purposes internal and external screw threads — Medium quality
(Part 3) : 2001	Deviations for constructional screw threads

3 TYPES

The thumb screws are of the following five types:

a) Type A — Thumb screws partially threaded;
b) Type B — Thumb screws fully threaded;
c) Type C — Slotted thumb screws partially threaded;
d) Type D — Slotted thumb screws fully threaded; and
e) Type E — Flat thumb screws.

4 DIMENSIONS

4.1 The dimensions of knurled thumb screw shall be as given in Table 1 when read with Fig. 1.

4.2 The preferred length-diameter combination of knurled thumb screw of Type A to Type D shall be as given in Table 2 when read with Fig. 1.

4.3 The preferred length-diameter combination of knurled thumb screw of Type E shall be as given in Table 3 when read with Fig. 1.

5 TECHNICAL SUPPLY CONDITIONS

5.1 The technical supply conditions shall be as given in Table 4.

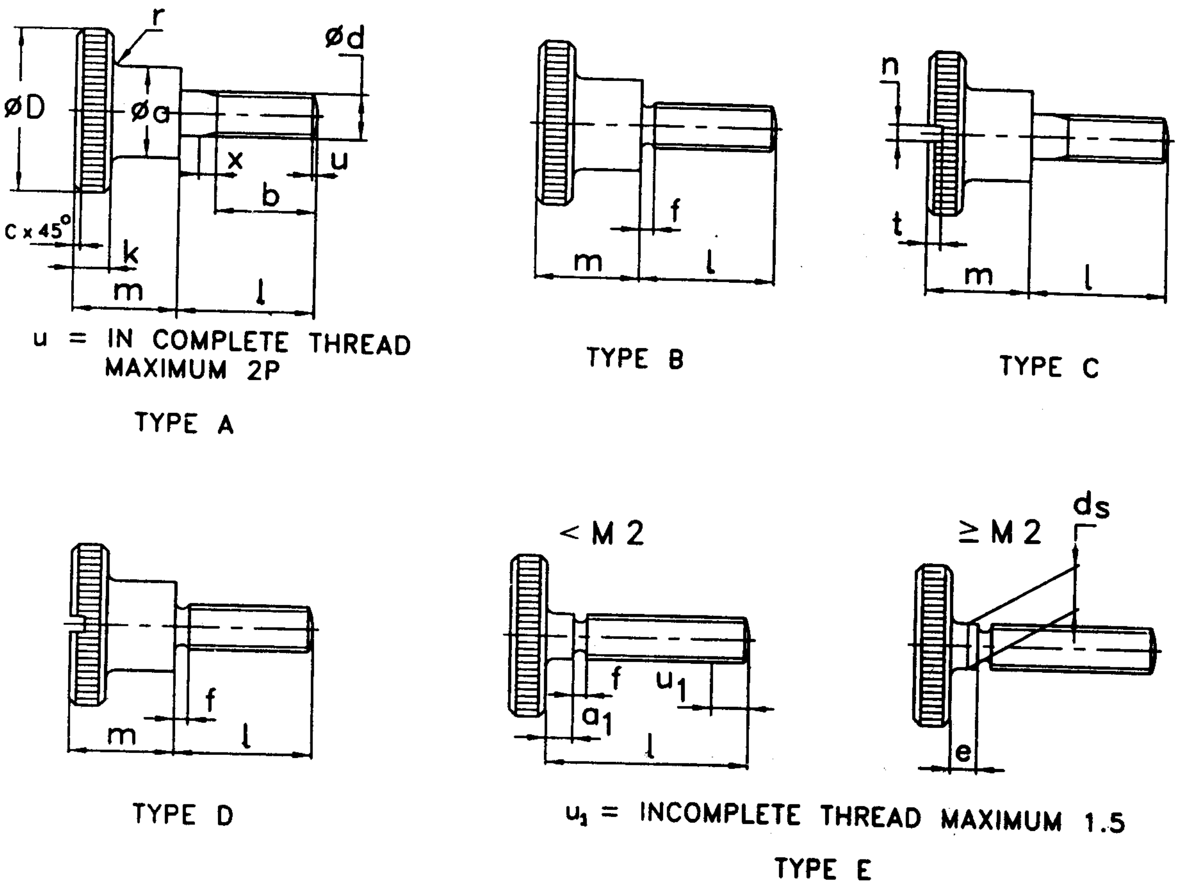
5.2 Material

The material of thumb screw made of non-ferrous metal shall be as specified in Table 5.

5.2.1 *Mechanical Properties*

When tested at standard reference temperature of 20 °C using the method described at **5.2.3** the screws shall have the mechanical properties as specified in Table 6.

NOTE — In case of high forming operation (such as special parts), the mechanical properties may be as agreed to between the purchaser and the supplier.



NOTES

1 Knurling from RAA as per IS 3403.

2 Threaded end with flat point (FL) or rounded end (RN) as per IS 1368.

3 Thread run out (*x*), thread under-cut (*f*) as per IS 1369 (Part 1) and IS 1369 (Part 2) respectively.

4 When the knurled thumb screw is manufactured in two parts these should be joined together such that the screw can transfer/withstand the same torque as in single piece construction.

FIG. 1 THUMB SCREW

5.2.2 *Mechanical Properties to be Tested*

Table 7 specifies which tests shall be carried out on the screws. Other tests are subject to the agreements between the purchaser and the supplier.

5.2.3 *Test Methods*

5.2.3.1 *Tensile tests applicable to screws*

For tensile testing, a full size screw shall be used and test shall be carried out as specified in IS 1367 (Part 3). For minimum breaking load *see* Table 8.

For testing the stress at permanent set limit, $R_{p\,0.2}$, and the percentage elongation after fracture, machined test pieces shall be used and the test shall be carried out as specified in IS 1367 (Part 3).

5.2.3.2 *Torsional strength tests*

For torsional strength test, a full size screw shall be used and test shall be carried out as specified in IS 1367 (Part 20). The accuracy of the measuring device shall be within ± 7 percent of the minimum breaking torque to be tested. The screw shall meet the minimum breaking torque as given in Table 9.

5.3 Passivation

5.3.1 *Pickling Prior to Passivation*

Before passivation, a pickling treatment in a bath selected from Table 10 is recommended. Before pickling, the screws shall be degreased and rinsed.

5.3.2 *Passivation Process*

After pickling, the fasteners shall be passivated in bath selected from Table 11.

5.3.3 *Verification of Passivation*

Passivation has to be verified by the manufacturer's quality system.

6 DESIGNATION

6.1 Thumb screws shall be designated by nomenclature type, thread size, nominal length, number of this Indian Standard and symbol of mechanical properties.

Example

A thumb screw of Type A, size M 6, nominal length 12 mm, and of property class 4.6 shall be designated as :

Thumb Screw A M 6 × 12 IS 3726 – 4.6

6.2 The Type E thumb screws which are fully threaded up to the head shall be designated as given in Table 3 (*see also* Note 4 of Table 3).

6.3 When stainless steel, brass or any other non-ferrous material is used for manufacture, the word 'stainless steel, brass or the name of the non-ferrous material used' shall replace the property class number in the designation (*see* **6.1**).

7 GENERAL REQUIREMENTS

The requirements for thumb screw not covered in this standard, shall conform to the general requirements given in IS 1367 (Part 1).

8 SAMPLING INSPECTION AND ACCEPTANCE CRITERIA

The sampling, inspection and acceptance criteria of the thumb screws shall be in accordance with IS 1367 (Part 17).

9 MARKING

9.1 The marking on the thumb screws shall be as per IS 1367 (Part 3).

9.2 BIS Certification Marking

The product may also be marked with the Standard Mark. Wherever it is not possible to put the Standard Mark on the product, it may be marked on the packaging.

9.2.1 The use of the Standard Mark is governed by the provision of *Bureau of Indian Standards Act,* 1986 and the Rules and regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to the manufacturers or producers may be obtained from the Bureau of Indian Standards.

10 PACKAGING

The packaging of thumb screws shall be done in accordance to IS 1367 (Part 18).

Table 1 Dimensions for Thumb Screws

(*Clause* 4.1)

All dimensions in millimetres.

Nominal Size, *d*		M1	M1.2	M1.4	M1.6	M2	M2.5	M3	(M3.5)	M4	M5	M6	M8	M10
P [1]		0.25	0.25	0.3	0.35	0.4	0.45	0.5	0.6	0.7	0.8	1	1.25	1.5
b		3	3.5	4	5	6	8	9	10	12	15	18	24	30
	c		Edges to be rounded				0.3	0.3	0.4	0.4	0.4	0.5	0.6	0.8
D	*Nom*	5.5	6	7	7.5	9	11	12	14	16	20	24	30	36
	Max	5.74	6.24	7.29	7.79	9.29	11.35	12.35	14.35	16.35	20.42	24.42	30.42	36.5
	Min	5.26	5.76	6.71	7.21	8.71	10.65	11.65	13.65	15.65	19.58	23.58	29.58	35.5
a	*Nom = Max*	2.8	3	3.5	3.8	4.5	5	6	7	8	10	12	16	20
	Min	2.55	2.75	3.2	3.5	4.2	4.7	5.7	6.64	7.64	9.64	11.57	15.57	19.48
m	*Nom*	3.5	4	4.7	5	5.3	6.5	7.5	8.5	9.5	11.5	15	18	23
	Max	3.74	4.24	4.94	5.24	5.54	6.79	7.79	8.79	9.79	11.85	15.35	18.35	23.42
	Min	3.26	3.76	4.46	4.76	5.06	6.21	7.21	8.21	9.21	11.15	14.65	17.65	22.58
k	*Nom = Max*	1.5	1.5	2	2	2	2.5	2.5	3	3.5	4	5	6	8
	Min	1.25	1.25	1.75	1.75	1.75	2.25	2.25	2.75	3.2	3.7	4.7	5.7	7.64
n	*Nom*	0.3	0.4	0.4	0.4	0.5	0.6	0.8	0.8	1.06	1.26	1.66	2.06	2.56
	Max	0.5	0.6	0.6	0.6	0.7	0.8	1	1	1.2	1.51	1.91	2.31	2.81
	Min	0.36	0.36	0.46	0.46	0.56	0.66	0.86	0.86	1.06	1.26	1.66	2.06	2.56
r		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	1	2	2
t	*Max*	0.9	1	1.15	1.3	1.4	1.8	2.2	2.5	2.7	3.4	4.3	5.5	7
	Min	0.7	0.8	0.9	1	1.1	1.5	1.8	2	2.2	2.8	3.5	4.5	6
a_1	*Max*	0.75	0.75	0.9	1.05	1.2	1.35	1.5	1.8	2.1	2.4	3	3.75	4.5
d_s	*Nom = Max*	–	–	–	–	2	2.5	3	3.5	4	5	6	8	10
	Min	–	–	–	–	1.86	2.36	2.86	3.32	3.82	4.82	5.82	7.78	9.78
e		–	–	–	–	1.5	2	2	2.5	3	3	4	5	6
Knurling pitch		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.8

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[1] *P* = Thread pitch (coarse).

Table 2 Preferred Length-Diameter Combinations for Thumb Screws Types A to D

(*Clause* 4.2)

All dimensions in millimetres.

Nominal Size, *d*			M1	M1.2	M1.4	M1.6	M2	M2.5	M3	(M3.5)	M4	M5	M6	M8	M10
Length, *l*															
Nom	*Min*	*Max*													
2	1.9	2.1													
3	2.9	3.1													
4	3.9	4.1													
5	4.8	5.2													
6	5.8	6.2													
8	7.8	8.2													
10	9.7	10.3													
12	11.7	12.3													
(14)	13.7	14.3													
16	15.7	16.3													
(18)	17.7	18.3													
20	19.6	20.4													
(22)	21.6	22.4													
25	24.6	25.4													
(28)	27.6	28.4													
30	29.6	30.4													
(32)	31.6	32.5													
35	34.5	35.5													
(38)	37.5	38.5													
40	39.5	40.5													

NOTES

1 Sizes and intermediate lengths given in brackets are non-preferred and to be avoided as far as possible.

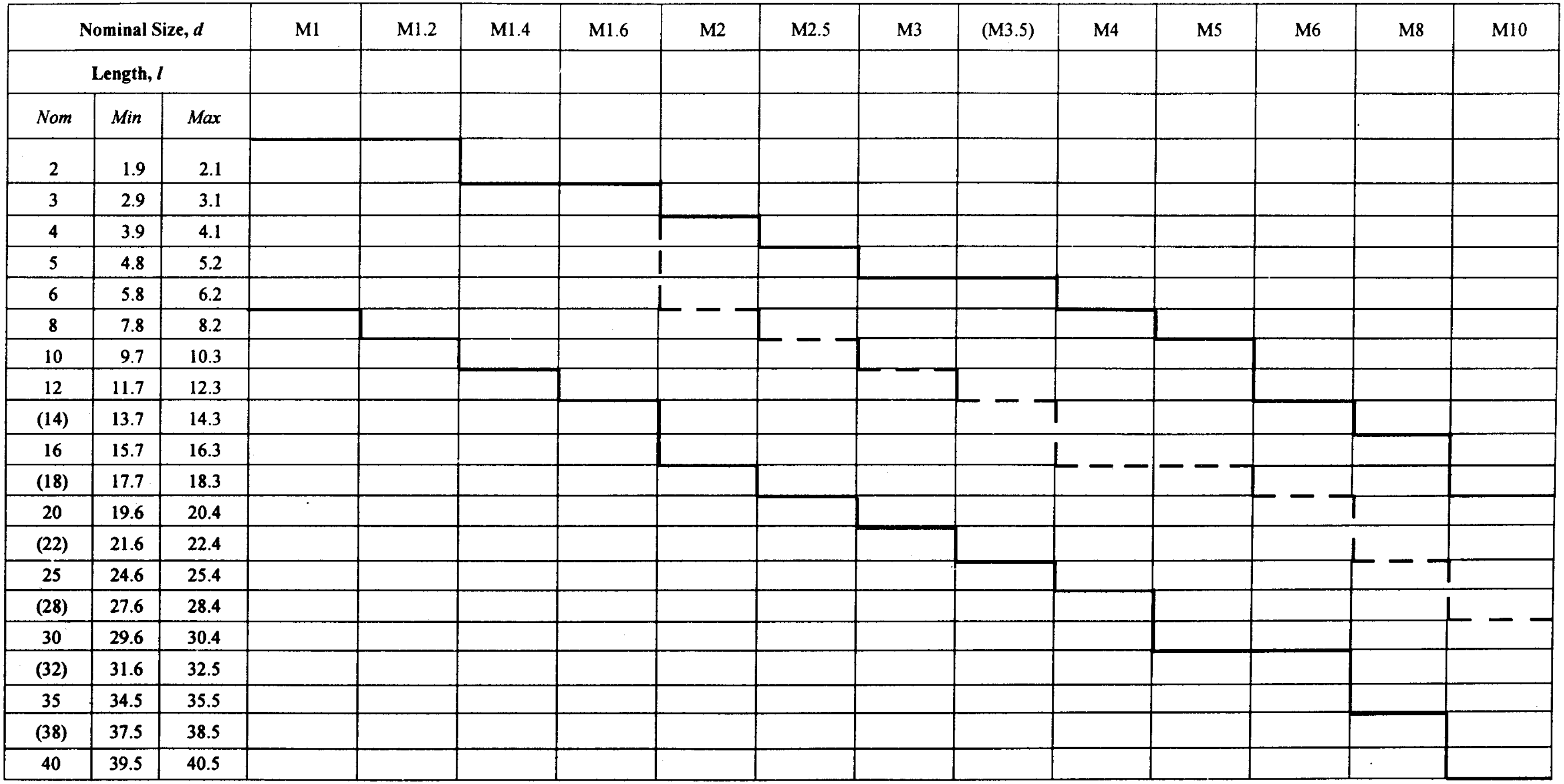
2 Lengths above 40 mm are provided in steps of 5 mm.

3 Sizes between thick lines are preferred. Sizes above dotted lines are fully threaded.

Table 3 Preferred Length-Diameter Combinations for Thumb Screws Type E

(*Clause* 4.3)

All dimensions in millimetres.



Nominal Size, *d*			M1	M1.2	M1.4	M1.6	M2	M2.5	M3	(M3.5)	M4	M5	M6	M8	M10
Length, *l*															
Nom	*Min*	*Max*													
2	1.9	2.1													
3	2.9	3.1													
4	3.9	4.1													
5	4.8	5.2													
6	5.8	6.2													
8	7.8	8.2													
10	9.7	10.3													
12	11.7	12.3													
(14)	13.7	14.3													
16	15.7	16.3													
(18)	17.7	18.3													
20	19.6	20.4													
(22)	21.6	22.4													
25	24.6	25.4													
(28)	27.6	28.4													
30	29.6	30.4													
(32)	31.6	32.5													
35	34.5	35.5													
(38)	37.5	38.5													
40	39.5	40.5													

NOTES

1 Sizes and intermediate lengths given in brackets are non-preferred and to be avoided as far as possible.

2 Lengths above 40 mm are provided in steps of 5 mm.

3 Sizes between thick lines are preferred. For sizes above the stepped dotted lines the thumb screws are threaded up to the head ($e = 0$).

4 For sizes below the stepped line where it is required to have the thumb screws fully threaded up to the head ($e = 0$) the designation shall be modified as ' Thumb Screw E M8 × 30/30 IS 3726 – 4.6'.

Table 4 Technical Supply Conditions

(*Clause* 5.1)

Material		**Steel**	**Stainless Steel**	**Non-ferrous Metal**
General requirements		As per IS 1367(Part 1)		
Thread	Tolerance	≤ M1.4 – 6h; ≥ M1.6 – 6g		
	Standard	IS 4218 [Parts (1 to 4)] and IS 14962 [Parts (1 to 3)]		
Mechanical properties	Property Class (Material)	4.6	A1 – 50 C4 – 50	Material as per **5.2**
	Standard	IS 1367 (Part 3)	IS 1367 (Part 14/Sec 3)	
Permissible dimensions and form of deviations	Product Grade	A		
	Standard	IS 1367 (Part 2)		
Finish and/or Coating		As Manufactured	Plain	Plain
		Electroplating as per IS 1367 (Part 11) Limits for surface discontinuities as per IS 1367 (Part 9/ Sec 1)	Passivation as per **5.3**	Electroplating as per IS 1367 (Part 11)
Acceptance test		IS 1367 (Part 17)		
Packaging		IS 1367 (Part 18)		
Marking		IS 1367 (Part 3)		

Table 5 Materials and Symbols

(*Clause* 5.2)

Sl No. (1)	**Designation of Materials** (2)	**Symbols** (3)
i)	Cu-ETP or Cu FRHC	CU1
ii)	CuZn37	CU2
iii)	CuZn39Pb3	CU3
iv)	CuSn6	CU4
v)	CuNi1Si	CU5
vi)	CuZn40Mn1Pb	CU6
vii)	CuAl10Ni5Fe4	CU7
viii)	AlMg3	AL1
ix)	AlMg5	AL2
x)	AlSi1MgMn	AL3
xi)	AlCu4MgSi	AL4
xii)	AlZnMgCu 0.5	AL5
xiii)	AlZn5, 5MgCu	AL6

Table 6 Mechanical Properties

(*Clause* 5.2.1)

Sl No.	Material		Nominal Thread Diameter	Tensile Strength	Stress at Permanent Set Limit	Percentage Elongation After Fracture
	Symbol	Designation	*d*	R_m, *Min*	$R_{p0.2}$, *Min*	*A*, *Min*
				N/mm²	N/mm²	%
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	CU1	Cu-ETP or Cu-FRHC	$d \le$ M39	240	160	14
ii)	CU2	CuZn37	$d \le$ M6	440	340	11
			M6 < $d \le$ M39	370	250	19
iii)	CU3	CuZn39Pb3	$d \le$ M6	440	340	11
			M6 < $d \le$ M39	370	250	19
iv)	CU4	CuSn6	$d \le$ M12	470	340	22
v)	CU5	CuNi1Si	$d \le$ M39	590	540	12
vi)	CU6	CuZn40Mn1Pb	M6 < $d \le$ M39	440	180	18
vii)	AL1	AlMg3	$d \le$ M10	270	230	3
viii)	AL2	AlMg5	$d \le$ M14	310	205	6
ix)	AL3	AlSi1MgMn	$d \le$ M6	320	250	7
			M6 < $d \le$ M39	310	260	10
x)	AL4	AlCu4MgSi	$d \le$ M10	420	290	6
xi)	AL5	AlZnMgCu 0.5	$d \le$ M39	460	380	7
xii)	AL6	AlZn5, 5MgCu	$d \le$ M39	510	440	7

Table 7 Mechanical Properties to be Tested

(*Clause* 5.2.2)

Sl No.	Nominal Thread Diameter	Test(s) to be Carried Out
(1)	(2)	(3)
i)	$d \le$ M5	Tensile test and breaking torque test
ii)	$d >$ M5	Tensile test (Also, if required, stress at permanent set limit and percentage elongation after fracture)

Table 8 Minimum Breaking Loads

(*Clause* 5.2.3.1)

Nominal Thread Diameter	Pitch of the Thread	Nominal Stress Area	Symbols for Materials												
			CU1	CU2	CU3	CU4	CU5	CU6	CU7	AL1	AL2	AL3	AL4	AL5	AL6
	P	A_s	Minimum Breaking Loads $A_s \times R_m$												
d	mm	mm²	N												
M3	0.5	5.03	1 210	2 210	2 210	2 360	2 970	–	–	1 360	1 560	1 610	2 110	2 310	2 570
M3.5	0.6	6.78	1 630	2 980	2 980	3 190	4 000	–	–	1 830	2 100	2 170	2 850	3 120	3 460
M4	0.7	8.78	2 110	3 860	3 860	4 130	5 180	–	–	2 370	2 720	2 810	3 690	4 040	4 480
M5	0.8	14.2	3 410	6 250	6 250	6 670	8 380	–	–	3 830	4 400	4 540	5 960	6 530	7 240
M6	1	20.1	4 820	8 840	8 840	9 450	11 860	–	–	5 430	6 230	6 430	8 440	9 250	10 250
M7	1	28.9	6 940	10 690	10 690	13 580	17 050	12 720	–	7 800	8 960	8 960	12 140	13 290	14 740
M8	1.25	36.6	8 780	13 540	13 540	17 200	21 590	16 100	–	9 880	11 350	11 350	15 370	16 840	18 670
M10	1.5	58.0	13 920	21 460	21 460	27 260	34 220	25 520	–	15 660	17 980	17 980	24 360	26 680	29 580

Table 9 Minimum Breaking Torque

(*Clause* 5.2.3.2)

Nominal Thread Diameter	**Symbols for Materials**										
	CU1	CU2	CU3	CU4	CU5	AL1	AL2	AL3	AL4	AL5	AL6
	Minimum Breaking Torque										
d	N.m										
M1.6	0.06	0.10	0.10	0.11	0.14	0.06	0.07	0.08	0.1	0.11	0.12
M2	0.12	0.21	0.21	0.23	0.28	0.13	0.15	0.16	0.2	0.22	0.25
M2.5	0.24	0.45	0.45	0.5	0.6	0.27	0.3	0.3	0.43	0.47	0.5
M3	0.4	0.8	0.8	0.9	1.1	0.5	0.6	0.6	0.8	0.8	0.9
M3.5	0.7	1.3	1.3	1.4	1.7	0.8	0.9	0.9	1.2	1.3	1.5
M4	1	1.9	1.9	2	2.5	1.1	1.3	1.4	1.8	1.9	2.2
M5	2.1	3.8	3.8	4.1	5.1	2.4	2.7	2.8	3.7	4	4.5

Table 10 Pickling Bath

(*Clause* 5.3.1)

Sl No. (1)	Steel Grade and Condition (2)	Chemicals (3)	Volume Contents[3] % (4)	Temperature °C (5)	Typical Exposure Time for Fresh Bath[3] min (6)
i)	A2	HNO_3	20 to 30	20 to 60	10 to 30
ii)	A3				
iii)	A4				
iv)	A5				
v)	C3[1,2]				
vi)	F1				
		H_2SO_4	8 to 11	60 to 80	5 to 30
vii)	A1	HNO_3	10 to 15	20 to 60	10 to 30
viii)	C1[1,2]				
ix)	C4[1,2]				
		H_2SO_4	8 to 11	60 to 80	5 to 30

---

[1] Prior to the pickling hot forged C1, C3 and C4 fasteners have to be soft annealed to the softest condition and shot peened.

[2] For fasteners manufactured from soft annealed and ground C1, C3 and C4 raw material only a shot peened may be necessary.

[3] Some latitude is permitted in adjusting the acid concentration, temperature and exposure time.

Table 11 Passivation Bath

(*Clause* 5.3.2)

Sl No. (1)	Steel Grade (2)	Chemicals (3)	Volume Contents % (4)	Temperature °C (5)	Typical Exposure Time min (6)
i)	A2	HNO_3	20 to 50	20 to 40	10 to 30
ii)	A3				
iii)	A4				
iv)	A5				
v)	C1				
vi)	F1				
vii)	A1	HNO_3 [1]	25 to 35	15 to 40	10 to 30
viii)	C4				
ix)	A1	HNO_3 + $Na_2Cr_2O_72H_2O$[2]	8 to 11	15 to 40	10 to 30
x)	C4		2 to 6		

---

[1] Use preferably this bath.

[2] The addition of $Na_2Cr_2O_72H_2O$ may be used to minimize the discoloration or etching of high carbon and free cutting stainless steels.

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